CQ-TV

No. 107

JULY 1979

The Journal of the
British Amateur Television Club

The British Amateur Television Club.

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Membership enquiries should be sent to the Membership Secretary.

Advertisements and articles for C Q - T V should be sent to the Editor.

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TV ON THE AIR

By John L. Wood G3YQC

AWARDS

There are three new members this time who have gained the C Q - T V certificate. They are Trevor Brown, G8CJS who gets the bronze, Brian Summers, G8GQS who gets the bronze also, and Ken Walker G8DIR who gained the gold award. Congratulations to these members and may they keep up the good work.

Representations have been made to me to extend the C Q - T V award further, as there are some who find the gold standard too easy. I am looking into the possibility of a diamond standard which will be the ultimate. At present this is only on paper, but if adopted I promise you, it will be HARD.

ACTIVITY

There are no reprots of any really noteworthy TV contacts but I'm pleased to say that the postbag is looking a lot healthier this time.

G8DIR (Shrewsbury) continues with his high activity and many stations have been worked to gain his gold award. Ken as always is on the lookout for new stations and is O.K. in the callbook.

G8MYI in Leicester is receiving video on 70cm using a modified Rigonda receiver. Maybe we shall see some video leaving that QTH before long. Also in Leicester G8MVG is active again, although Bob is still doing battle with a 2C39A linear which positively refuses to remain in good working order, however, by now, hopefully, it should be sorted out.

Leicester again- G8ABD continues putting out a very consistant signal with a mixture of the "red Indian" monoscope test card, electronic patterns and live camera video sources. These transmissions are regularly received at my own QTH and over the last few years it is remarkable that the signal strength seldom varies even in good conditions.

Trevor Brown G8CJS (Leeds) uses a Microwave Modules 144/432 transverter modified as in C Q - T V 104. The aerial is a 46 element multibeam. Trevor has observed that once the contact has been established using the 150 Watt rig he is able to switch to 10 Watts and still maintain the contact, although of course, the white noise is increased somewhat. By looking at the distances involved from Trevor's award application this certainly says a lot for the low power transmitter.

Brian Summers G8GQS (Gainsborough, Lincs) is still very active and doing well in the North Lincs and Nottingham areas. Brian would like to hear from stations who would like to work him.

Andy G8PTH (Canterbury) writes to say that he is on the air with fast scan at last (his words and that if the broadcast DX TV is anything to go by then across the water TV contacts should be no problem when the band lifts. Andy has carried out successful tests with G8EQZ at Rainham (25 miles) with a P2 report, and local tests with G8BRD one mile away. The transmitter is a fairly new product from the USA. It is by PC electronics and is solid state and delivers a very healthy 10 Wattes of video. Andy comments on the excellent linearity and it's compactness. Sounds like a good rig. Video generation is by two cameras, a variety of test patterns and a Phillips N1500 VCR. Future expansion is to include a TV typewriter (when a good design presents itself) and a 100 Watt linear. How about some photos of the future continental contacts Andy?

G8PLP (Warley, West Midlands) is very active with a "G5KS Special" transmitter which seems to be doing a fine job despite the low output power, however plans are afoot to boost this a bit. Dave also enthuses about the regular colour transmissions which he recieves from G5KS. He considers that they compare very favourably with broadcast signals. G8PLP recently gave a demonstration to the Midlands TV Group which aroused a good deal of interest and several newcomers have threatened to have a go!

G8DYP (Nr. Cannock) is on the air with about 600 mW of video and is currently carrying out tests on solid state linear amplifiers.

Arthur, G5KS is to give a talk and demonstration on the modern techniques of ATV transmitting to the Midlands Video Group. Arthur has one of his cameras completely remote controlled now, so he can operate it from the usual operating position. This makes life nice and easy.

Well that's all for this time. Please keep the mail coming and address it as usual to: TV on the Air, 54 Elkington Road, Yelvertoft, Northampton, NN6 7LU. Tel. (0788) 823250.

REVIEWS

PC Electronics (USA) 10 watt Solid State ATV Transmitter Modules

The products described here are two from a growing range of ATV items produced by Tom O'Hara, a well known American ATV enthusiast and writer. The two units reviewed here form an "off the shelf" 10 watt solid state dsb tv transmitter, with a very attractive specification. One is a pcb dimensioned 5½" x 3½" and is an 80mW exciter and modulator; the other is a 10W PA module on a heatsink 4½" x 3". Here is the technical description:

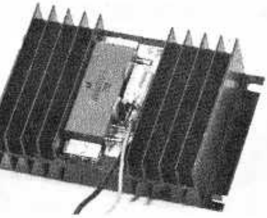
ATV EXCITER

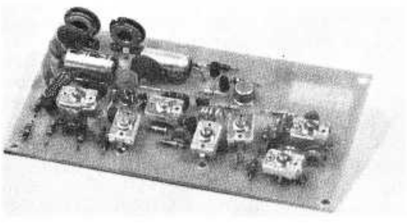
This is a wired and tested module designed to drive a Motorola MHW-710 power module to 10W output. The exciter consists of a crystal oscillator operating in the 100 MHz region to keep any harmonics out of two metres, two doublers and a final. The high resolution video modulator (8 MHz) drives both the final and the second doubler for good linearity. Also DC restoration is used to give maximum power or sync tips and black blacks regardless of picture average level. Requires +12V reg. at 70mA.

POWER MODULE

The PA5 will put out 10W of high resolution video when driven by the Exciter, requires +12V reg at 3A and 80 mW drive.

If you haven't come across it before, the MHW-710 power module is a hybrid IC and transistor device mounted on a heatsink flange and potted in lurid blue epoxy. It is not essentially a linear device and is in fact designed as a 15W class C linear for radiotelephone use. It is a wideband device and is in fact used as the PA stage of several commercial 70cm ham rigs in the States. When correctly biassed and driven, however, it works in a linear fashion, though with reduced power output which is why the PA5 unit is rated at only 10W out.



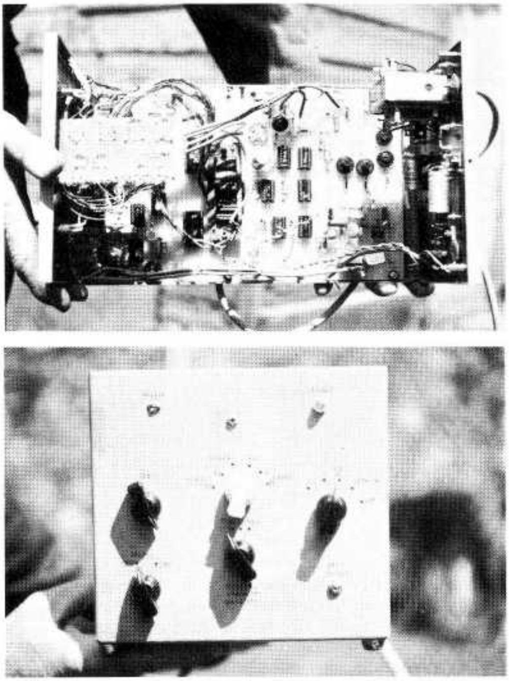


So much for the theoretical description: how do the devices turn out in practice? Well, the finish of the modules was very good: pcbs are glass-fibred and construction very professional. I decided tp put the exciter module in a small steel box and mount the PA5 on top, leaving room for a ASTEC tv games 6 MHz audio modulator and a microphone preamp to be added later. I am pleased to report the devices performed completely to spec. Looking at the detected video on the RF output I found it to be a perfect replica of the signal going in, so the linearity of the units is not in doubt. Slightly more power (and deeper syncs) can be squeezed out at the expense of limiting the whites a bit. The units are very stable and do not get unduly hot. On test my unit ran for over two hours continuously with no problems and the device is capable of continuous operation. all in all the two devices form an extremely compact tv tx with a healthy 10W output.

What's the price? I hear you ask. Well, the TXA5-2 exciter with crystal and aligned is $84 and the PA5 £79. Without crystal and alignment prices are lower. To these prices you must add airmail postage ($2), VAT and duty (about £9 per item). The dollar rate is quite favourable now and you can forget the expense and problems of international money orders: you can order by letter or phone quoting your Access or Barclaycard number and expiry date. The total cost will not leave you much change out of £100 then and will put some people off - on the other hand compared with a commecial transverter or 10W FM transceiver for 70 cm the price is not so unreasonable and you are buying quality merchandise designed exactly for its purpose. Verdict - recommended and fair value for money.

P.S. I did pay for my units and I am not on the payroll of PC Electronics! If you would like further details of this range of ATV and video gear (1296 MHz coming soon, I hear) see the announcement in the members' ads.

Andrew Emmerson G8PTH



Two photographs of an Auto CQer built by Johnny Brown G3LPB to a G3LEE design.

A GUIDE TO

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Chapters on RECEIVING, TRANSMITTING, MONITORS, PICTURE SOURCES, COLOUR, RECORDING, SLOW SCAN TV together with details of Licences, history of B.A.T.C. and a list of other recommended books.

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CONTEST NEWS

Contest Organiser Graham Shirville G3VZV

COMMENT

Well- after promises in the last edition by yours truly to reduce the amount of confusion concerning B.A.T.C. contests you must have been surprised to read of two contests taking place on June 3rd!! I believe our illustrious Editor included the Gwent ATV contest under my byline with the best of intentions but the resulting egg on my face will cost him a couple of pints when I catch up with him. Well, now certainly no one can complain of lack of TV contests.

(Editor's note ; actually, I was rather worried that I may have caused confusion by adding this contest to the official list - so I concede ! But if it's two pints, then it's my choice of beer. And anyway, where the hell was I supposed to put it ?

One clarification concerning the rules for the international TV contest relates to receiving only stations. Although the rules do not include this category if listeners/viewers would like to send their entries (on the same basis as other entrants) I will publish their "score" along with the other results. If there are a sufficient number I might even award a prize.

FUTURE

INTERNATIONAL A.T.V. ACTIVITY CONTEST

DATE/TIME 18.00 GMT 8 SEPT. 12.00 GMT 9 SEPT. 1979.

Full rules were in C Q - T V 106 April edition and a further copy together with log sheets and cover sheets can be obtained from me on receipt of an s.a.e.

As you know this contest is organised jointly with our European counterparts AGAF, ATA and REF and there will be a very large number of stations operational in F, DL, PA0 and ON. I hope therefore that we will have a large entry from G and GW and dare I hope even for some logs from some of the other prefixes so we make a good showing.

THE BRITISH AMATEUR TELEVISION CLUB U.K. SSTV CONTEST

DATE The 24th and 25th of November 1979

FREQUENCY BANDS The 3.5 MHz and 144.00 MHz Bands and via any amateur satellite

TIMES 19.00 to 23.00 GMT on Saturday 25th November
9.00 to 13.00 GMT on Sunday 26th November

ELIGIBLE ENTRANTS All entrants must participate in the contest fron a UK location.

SECTIONS Section A Stations both transmitting and receiving SSTV
Section B Stations only logging SSTV signals.

CONTEST EXCHANGE The Contest Exchange shall consist of the Call sign, Signal report (RST), Serial number, QRA locator or QTH (Of these the last three shall be exchanged in video only. Serial numbers shall commence at 001 and advance by 1 during the duration of the contest. Only one contact with each station will on any one band count for points.

SCORING Section A.
5 points per station contacted on the 3.5 MHz band.
20 points per station contacted on the 144.00 MHz band.
50 points per station contacted via Satellite.

Section B
As above for each station logged.

CONTEST LOG The Contest entry Log must give the following information: date, time, band, Callsign received, Report and serial No. received, QRA locator/QTH received points claimed (listing separately each band) and Final Score.

ENTRIES All entries should be postmarked not later than the 10th December 1979 and should be sent to: Mr. G.P. Shirville G3V2V, 18 Church End, Milton Bryan, Milton Keynes, Bucks.

GENERAL Each entry should be accompanied by a brief description of the station together with details of the Callsign used, the QRA locator and QTH locations as transmitted on sound and vision together with any other relevant information. Stations entering the contest may only operate from one location for contest contacts. Stations who confirm their video message contents by sound will render themselves liable to disqualification. Results of the Contest will be published in C Q - T V as soon as possible.

As you will see the rules and scoring have been slightly altered (improved?) from previous years and if there are a sufficient number of entries prizes and certificates will be awarded to the overall winner and to the leading stations on each band.

Well, that's all I have this month. There has been no response so far to my enquiry about who holds the DX-TV (2way) record, so lets have some claims.

News, views, photographs and comments are welcome to my address as in the front cover or by telex 2618 ALGL G marked for my attention.

A Simple TV Station

By G8DLX

The following notes are intended to answer some of the questions asked by amateurs becoming interested in Amateur Television.

AERIALS Most of the normal 70 cm amateur aerials are suitable for ATV work, the main exception being the J beam 14 ell. which has too narrow a band width. Probably the most used aerial is the J beam 18 ell. which proves to be reliable.

PRE AMP Although not essential, a good low niose pre amp will be of use with weaker stations. The normal designs will usually cope with the bandwidth required for tv. For best results the pre amp should be mounted as close to the aerials as possible in the usual mast head configuration.

CONVERTOR The most used convertor for ATV reception is the Mullard ELC1043 (1) this will tune down to 70 cm if the tuning voltage is kept down to about 1 volt. The output will feed into either the tv IF strip or the aerial socket of a VHF TV on channel 1. Connections for the tuner are given in (2). There are no mods needed to the 1043 tuner but the 1043/05 which is the lower noise version does need some simple mods (2).

TELEVISION For reasons of safety the portable type of tv is preferred, but not essential. As most amateur transmissions are now on 625 lines the easiest method of reception is to use a dual standard set with the change over switch modified to give 625 line on VHF. The signal can then be fed into the aerial socket. The most suitable and versatile set is the Sony 9-90 UB (3) which is unfortunately now out of production.

CAMERA Many tv cameras are now appearing on the second-hand market; these have mostly been used in shops for security reasons. Most of these cameras give a standard 1 volt p-p output which makes them ideal for ATV work. Some TV camera designs have appeared in various magazines (4) and these are also suitable for ATV work. Instead of a camera a pattern generator can be used. (5).

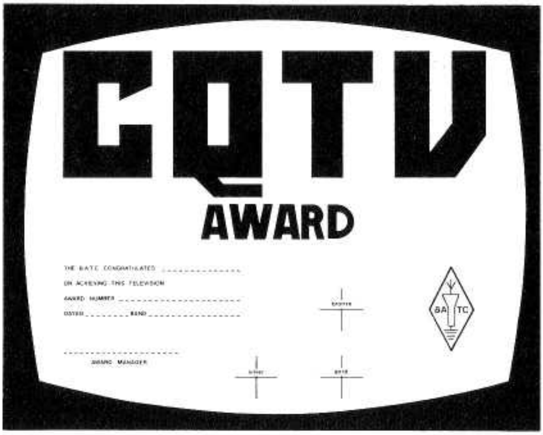
TX IF BOARD This simple 6 transistor circuit was originally given as part of a complete tv transmitter (6) This unit generates a signal at 35 MHz and takes the output of a camera and modulates the video onto the RF. If the crystal frequency is changed to 31.5 MHz it can be fed into a transverter and the resultant output will be on 435.5 MHz.

TRANSVERTER The output of the tx IF board can be fed through a normal 28-30 MHz input 432-434MHz output transverter the 31.5 MHz input giving 435.5 MHz output. The transverter normally used is the Microwave Modules one (7) and it needs no modifications to accept the vision at this frequency. The output from the transverter will be about 3-4 watts, the internal strap for various power feeds should be in the most sensitive position. Other transverters will probably work O.K. but have not been tried.

SOUND It is easiest to use 2 M for the sound links, 144.75 being the suggested tv frequency. For the sound ident on vision frequency audio from a pre amp can be fed into the IF in place of the camera.

(1) ECL1043 circuit & description Television May 1973
(2) Mods to ECL1043 C Q - T V 81 & 94 and Amateur Television Handbook
(3) Mods to Sony 9-90 UB C Q - T V 90
(4) Cameras ATV HB & ETI Dec. 1977
(5) Pattern & Pulse Generators C Q - T V 100-103 VHF Com. Vol. 5 Ed. 1 & 3
(6) 31.5 MHz IF board VHF Com. Vol. 5 Ed. 1
(7) MM Transverter Review Radio Communication August 1978.

the CQ TV AWARD



CQTV
AWARD

THE B.A.T.C. CONGRATULATES ______________

ON ACHIEVING THIS TELEVISION

AWARD NUMBER ____________________

DATED ________ BAND ________________

____

AWARD MANAGER

To mark the one hundreth issue of C Q - T V B.A.T.C. introduced an operating award scheme whose aim is to encourage activity in amateur television by providing an incentive in the form of a certificate.

This award is available to both transmitting and receiving amateurs and SWLs in any part of the world whether they are members of the British Amateur Television Club or not.

The award is for contacts made using fast scan high definition television systems only.

Consideration has been given to the advantages achieved by stations in high activity areas or with exceptional geographical locations, therefore qualification for the award is on a points basis as detailed below.

TRANSMITTING AWARD

For pictures transmitted which have been successfully identified by another station claim 2 points per kilometer; if the contact becomes a successful 2-way exchange of pictures then 10 bonus points may be claimed by each station regardless of distance.

Careful logging of transmissions is essential.

RECEIVING AWARD

For any picture positively identified claim 2 points per kilometer.

POINTS

Points are claimed as above- however, if the contact is on 23 cm or above, the points should be doubled.

The award is divided into three grades, for the Bronze - 1000 points, for the Silver 5000 points and for the Gold 10,000 points.

CONTACTS

A station may be worked once only per day for the purpose of this award.

It is quite possible for the award to be gained by working the same station many times, but the aim is to promote activity of any sort. Points may be claimed only for contacts made from the 1st November 1977.

THE CERTIFICATE

Upon qualification for the Bronze award a certificate will be issued together with the Bronze seal; the certificate may be upgraded later with Silver and Gold seals.

No charge will be made for the award, but please send return postage with each application.

APPLICATIONS

Applications should include log details consisting of call-sign, date of QSO, band, location of the station worked and points claimed. Contacts made from other than the home station should be clearly marked.

QSL cards are not required, but the application should be checked and signed by one other licenced amateur.

Applications should be made to the award manager, John L. Wood G3YQC, 54 Elkington Road, Yelvertoft, Northampton, NN6 7LU.

B.A.T.C. financial results.

STATEMENT OF ACCOUNTS FOR THE YEAR ENDED 31st DECEMBER 1978

	1978			1977	
INCOME					
Entry fees	88.50			38	
Subscriptions : Current	1,850.30			1632	
Arrears	144.00			33	
Donations	10.00	2,092.80		10	1713
Sales of CQ-TV	221.79			263	
Advertising income	58.00	279.79		70	333
Building Society interest		132.67			117
Sales of Amateur TV	635.25			1070	
SSTV	12.35			74	
	647.60			1144	
Less Costs of Sales	118.35	529.25		746	398
Profit on Sale of Typewriter		19.00	SSTV Convention		20
		3,053.51			2581
EXPENDITURE					
CQ-TV: Printing	1,239.29			907	
Postages	506.69			374	
	1,745.98			1281	
Gen. postage & Staty	286.03			235	
RSGB Affiliation fee	3.25			3	
Meeting expenses:					
Hall hires	100.00			-	
Insurance	38.94			-	
Depreciation: Typewriter etc	25.00	2,199.78		7	1526
SURPLUS for the year		£ 853.73			1055

TRADING ACCOUNT

	1978		1977	
Sales of equipment		857.42		899
Less Cost: Stock 1.1.78	379.74		387	
Purchased	659.04		794	
	1,038.78		1191	
Stock 31.12.78	371.40	667.38	380	811
SURPLUS for the year		£ 190.04		88

BALANCE SHEET AT 31ST DECEMBER 1978

RESOURCES of the CLUB			1977	
Accumulated Fund:				
Balance at 1 Jan. 1978		2,907.53		1764
Surplus General A/C	853.73		1055	
Trading A/C	190.04	1,043.77	88	1143
Balance at Dec. 31 1987		3,951.30		2907
Represented by:-				
FIXED ASSETS				
Office equipment at 1.1.78	27.00			
Addition (less Sale)	99.00			
	126.00			
Less Depreciation	25.00	101.00		27
CURRENT ASSETS				
Stocks: Trading	371.40		380	
C Q - T V Mags.	36.02		35	
Am TV Booklets	50.40		164	
SSTV Booklets	5.00		10	
Stationery	87.00		237	
	549.82		826	
Balance with Bank	822.75		610	
Giro	164.03		112	
Build. Soc.	3,035.35		2403	
	4,571.95		3951	
CURRENT LIABILITIES				
Creditors	193.65		428	
Subscriptions in advance	528.00		643	
	721.65		1071	
NET CURRENT ASSETS				
		3,350.30		2880
		3,951.30		2907

The above balance sheet at 31st December 1978, together with the General and Trading Accounts for the year ended on that date, are in accordance with the books of the Club as produced to me and, to the best of my knowledge and belief, show a true and fair view of the position of the Club at 31st December 1978 and of the results for the year.

BRIGG
14th April 1979

J. R. Gregory
Chartered Accountant

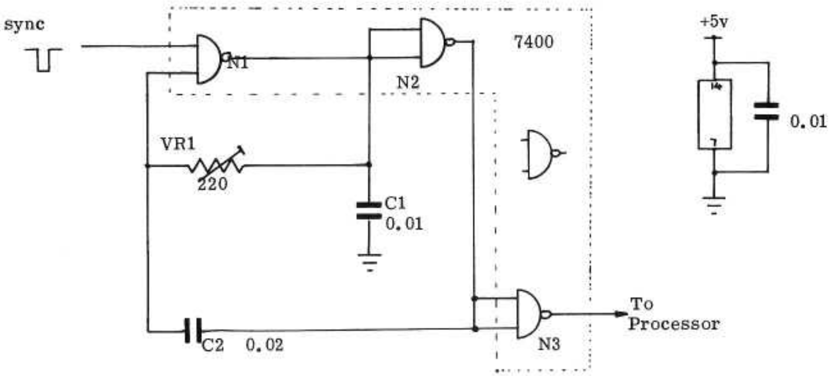
A Video Pulse Generator

by K. Buck

During the recent CEEFAX breakdown, nearly one week at the time of writing, a pattern consisting of eight vertical bars was substituted on the local cable TV system.

This circuit produces a similar pattern. Gates N1 and N2 form an oscillator VR1 adjusting the frequency. The oscillator is locked by sync or blanking pulses, at TTL level. C2 controls the pulse width and gate N3 shapes and inverts the waveform, giving positive-going non-composite video on the output for feeding to a processor which can be another 7400 fed with sync and blanking to Tx or via a UHF modulator for a domestic TV. This circuit can also be a useful source of pulses for driving other generators.

By feeding the output to an invertor and connecting to a changeover switch, positive or negative pulses can be selected. A two pole wafer can be used to select different values of capacitors, C1 should only be a slight change, but C2 can be drastically reduced. No tests have been made with such modifications, but the circuit as shown gives excellent results at RF.



THE VIDEO COLUMN

By Jeffrey Borin.

In contrast with the last time, this Video Column will be devoted to just one subject - video and audio switching. At its simplest this is achieved with jackfields and patch leads. A need for greater convenience and electrical control leads to the use of mechanical switches, relays and finally to fully electronic switching.

As a footnote to the last video column I should add that many IVC and some Ampex one inch VTR's were colour-capable.

The problems of switching

There are three major problems associated with switching video and audio signals. Generally they are more severe for video due to the much greater bandwidth.

1. "ON" state imperfections such as poor frequency response and harmonic distortion.
2. "OFF" state troubles such as breakthrough and crosstalk.
3. Cleanliness of switching, clicks and disturbances.

1 and 2 are caused mainly by on-state resistances and off-state capacitances. They cause very little trouble in audio circuits. Clean switching is a requirement of circuits that must operate "on-air". In video the operation of an electronic switch can frequently be concealed in field blanking. Mechanical switches and relays will inevitably give a slight disturbance. When switching audio, even with electronic switches, it is relatively difficult to avoid an audible click. This is not serious for many applications since audio is usually faded up and down.

Video special effects circuits require extremely clean switching since they must operate during the active picture area. None of the switches discussed in this article are suitable for critical FX work though some of the electronic switches will give reasonable results.

Switching devices

Ignoring jackfields there are three main groups of switching devices:

1. Mechanical, e.g. rotary, toggle and slide switches.
2. Electromechanical, i.e. relays, reed relays and uniselectors.
3. Electronic, using transistors, diodes FETs or ICs.

There is little to say about mechanical switches. They must be capable of good contact at very low signal levels. Some types of toggle switch are very poor in this field.

Small plug-in relays, especially metal-cased varieties, are very suitable for video and audio switching. Reed relays are excellent for audio applications and even the older PO 3000 and other open relays are usable though rather bulky. Uniselectors enable large systems to be made very cheaply but are mechanically very noisy and tend to suffer from contact problems unless maintained thoroughly.

The simplest electronic switches are probably the CMOS analogue switches. The following are some of the more popular devices:

4016	4 x SPST switches
4066	as 4016 but lower "ON" resistance
4051	8 input multiplexer
4052	Dual 4 input multiplexer
4053	Triple changeover
4067	16 input multiplexer

These devices give good results for audio for all but the very highest quality applications. The main problems are harmonic distortion if operated at high signal levels and breakthrough of clicks when actually switching. They are usable for video but require special precautions. The best electronic video switches are probably those using discrete diodes or transistors as the switching elements. An example of a simple system can be seen in C Q - T V 104 p. 11.

Switching Circuits

There are few problems with audio circuits, except with electronic switches, so this section deals only with video switching unless specifically stated otherwise. The main problem is preventing unwanted signals from leaking through switches that are nominally off. Ideally unwanted signals should be better than 60dB below wanted signals up to 5 MHz.

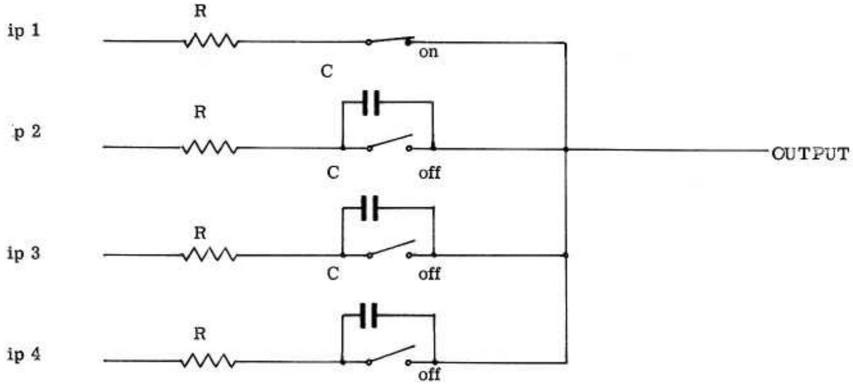
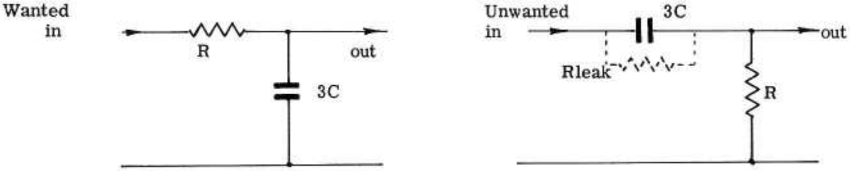


FIGURE 1 Stray Components in Switches.

Fig. 1 shows the nature of the problem on a four-way selector circuit; it is not relevant whether the actual switches are mechanical or electronic. Each switch that is ON has a series resistance R which comprises the resistance of the switch plus the impedance of the input source. When off each switch has a capacitance C. For any reasonable switch the problems of the ON and OFF states are represented by Figs. 2a and 2b respectively. In Fig. 2a the capacitances of the OFF switches form a low pass



(a) "ON" (b) "OFF"

FIGURE 2 Effective Circuits of Switches

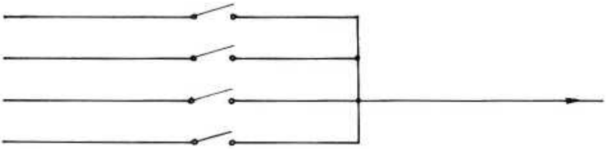
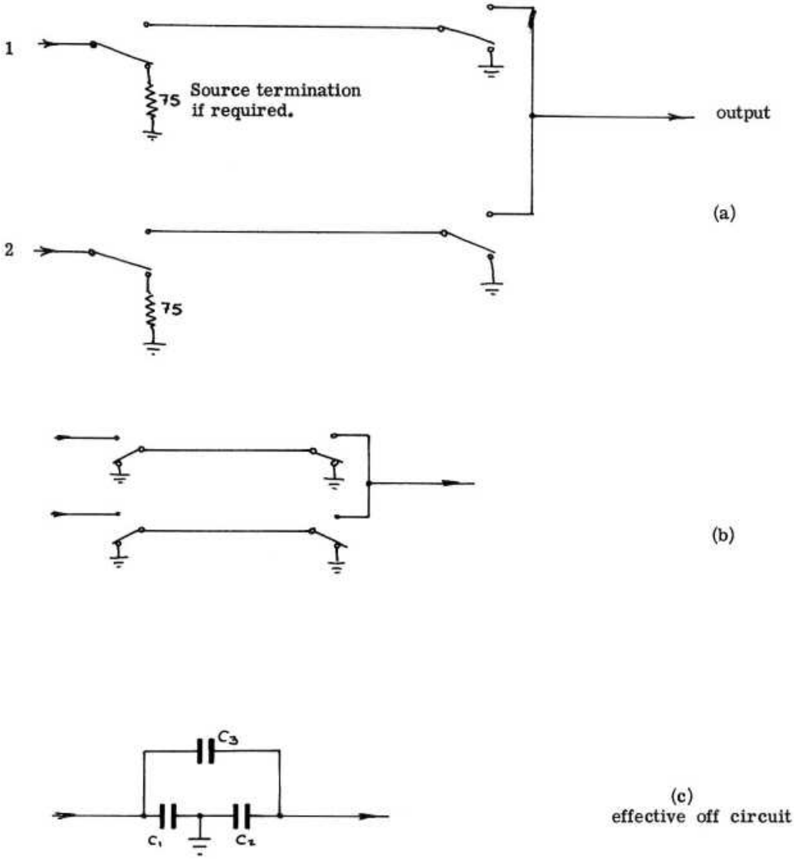


FIGURE 3 Fundamental "single break" switch system



(c)
effective off circuit

FIGURE 4 "DOUBLE BREAK" SWITCHES

filter limiting the high frequency response. Fig. 2b shows how high frequency signals from OFF switches can be fed into the wanted output. The resistive leakage component R leak in Fig. 2b. can be neglected for virtually all practical switches.

Fig. 3 represents the general circuit for any switching system and shows only one break in each signal path. This arrangement needs no description and can be used with any mechanical or electromechanical switches for non-critical video and virtually all audio applications. It is not suitable for high quality video applications since high frequency video components from unwanted sources will nearly always appear on the output. It is very irritating, for example, if crosshatch appears faintly whatever input is selected. It is even more annoying if a slightly non-synchronous source breaks through since this is usually visible as a moving edge of line sync pulses.

To minimise the effect of off-state capacitance the signal path must be broken twice. Fig. 4 gives two common double-break circuits. They can be extended to any number of inputs if required. Fig. 4a can automatically terminate unused 75 ohm inputs if required while Fig. 4b can sometimes be more convenient to assemble. Both of these methods can be used effectively with relays or interlocked mechanical push-buttons. They become hopelessly complex with rotary switches as the number of inputs increases. Fig. 5 shows how even a three input system requires much wiring which in itself will lead to poor isolation unless suitably screened.

Fig. 4c illustrates how a double-break circuit gives such good isolation. C1 and C2, the off-state capacitances, are no longer relevant since they are earthed at one end. C3 is very small indeed since the input and output terminals are now well separated.

If uniselectors are used (I do not recommend their use but they are sometimes a cheap way out of a problem) then double-break circuits are not practicable. All that can be done is to drive all inputs from very low impedances, keep all wiring screened and if possible use alternate contacts, earthing the ones between those in use. In practice they work surprisingly well.

A problem common to all mechanical, electromechanical and some electronic switches is shorting of sources either to earth or to each other. Fig. 6 shows the two problems. In Fig. 6b if S1 and S2 are both closed the inputs will be shorted together affecting anything else that utilises the inputs. The short can occur if S1 should make momentarily before S2 has broken. In Fig. 6a RL1a and b must be break-before-make contacts and RL1b must not operate after RL1a or the source will be shorted to earth. The problems can be reduced by adding isolation resistors of 50 to 100 ohms as in Fig. 7 which shows a 2 input, 2 output switching circuit. Under-running relay coils to give slow pull-in and fast drop-out also helps while most interlocking push buttons do not suffer from these problems. In practice few problems are encountered unless the effect is deliberately provoked, for example by using very dissimilar relays in one switching system.

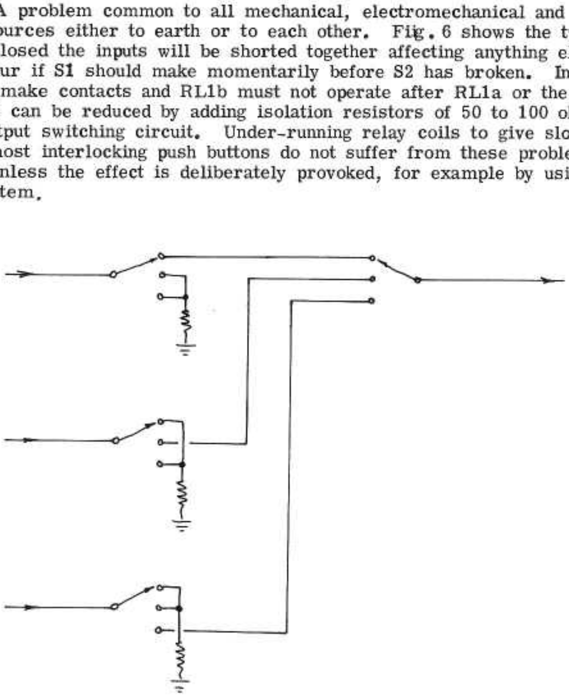


FIGURE 5 3 input switch using a rotary switch to give double breaks

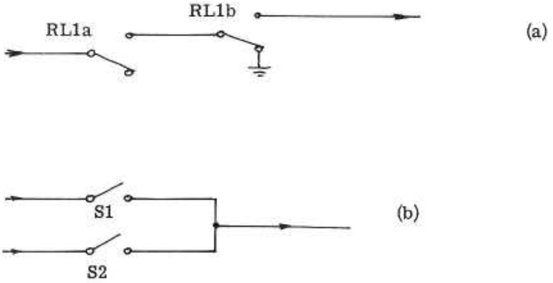


FIGURE 6 SHORTING OF SWITCHES

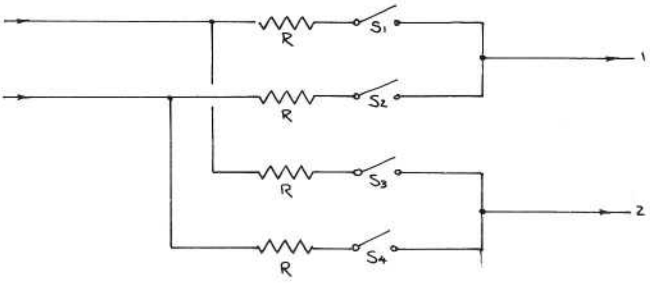


FIGURE 7 2 input, 2 output switch, with isolation resistors.

Electronic Switching

When CMOS analogue switches are used for audio it is likely, though I have not checked it, that placing the switches at a virtual earth as in Fig. 8 gives lower distortion due to the smaller signal voltages at the devices. The only other precaution is to bias the mean signal voltage halfway between the supply voltages to allow maximum undistorted output.

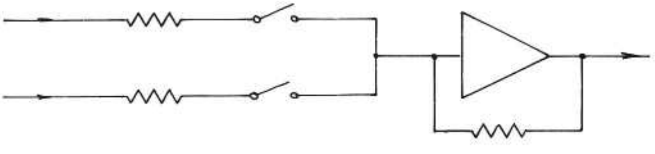


FIGURE 8 using CMOS switches at 'virtual earth', for audio.

Even at video a single-break circuit with CMOS switches can give fair results though signals such as crosshatch are almost guaranteed to break through visibly. Using the double-break circuits of Fig. 4 provides a solution giving remarkably good results despite the low cost. Unfortunately, their rather

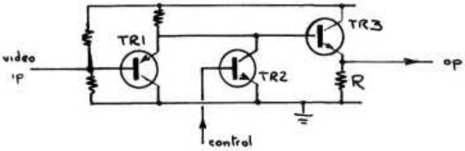


FIGURE 9
Discrete video switch. Load resistor R is common to several such switching cells.

high output capacitance makes it rather difficult to maintain bandwidth when more than four inputs are required. Fig. 9 outlines a very effective discrete component switch which is capable of the highest quality results. Up to ten or more of these units may be connected to a common output (NB only one load resistor R is required however many inputs are used). With refinements the circuit can give quite good FX switching though it is not ideal for that application. Although it is not immediately obvious, the circuit gives a double-break action, the base emitter junctions of both TR1 and TR3 being reverse bias when TR2 is switched on.

Input and output Buffers

For systems with more than one output buffer amplifiers are required. For audio the ubiquitous operational amplifier is the easiest solution while for video emitter followers and two transistor feedback pairs can be used. Examples are given in Fig. 10. The feedback pair circuit can readily be designed to drive 75 ohms circuits satisfactorily.

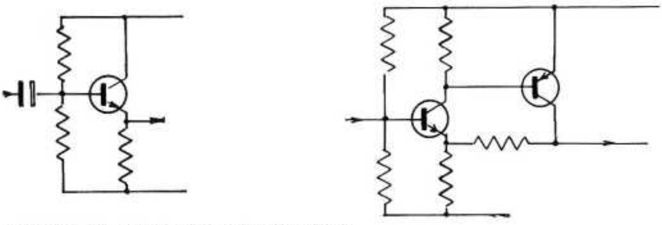


FIGURE 10 Typical input and output buffer amplifiers.

Switching Systems

The frequently conflicting requirements of low cost and high performance govern the choice of switching method. Unless very cheap surplus relays or uniselectors are used electronic switches will be cheaper than electromechanical devices as well as frequently giving higher performance. If electrical control is not needed then the ordinary rotary wafer switch is hard to beat for performance on a low budget.

Where switching, especially of video, must be performed "on-air" as in a vision mixer then electronic switches are undoubtedly best since with interfield cutting their operation can be totally undetectable. However, I have recently wired an emergency interim vision mixer with direct video switching on interlocked push buttons which despite using only a single-break system works well. However, I would not wish to try it with crosshatch or non-synchronous sources on any inputs.

A major problem with switching systems other than the very smallest is physically wiring them. For relays this is merely very tedious involving much stripping and terminating of minute lengths of co-ax (I will admit to have wired the emergency mixer mentioned above with ordinary unscreened wire but the less said about that the better). For electronic switches do not underestimate the problem of laying out a PCB, even on double sided board, since it is very difficult to design a layout which gives low crosstalk and still physically allows the connections to be made. It is only sensible to follow a matrix type layout as shown in

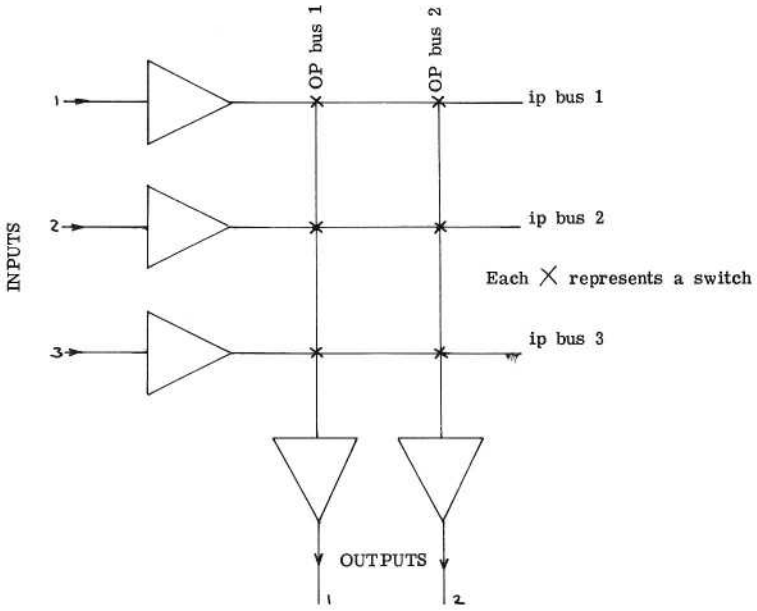


FIGURE 11 Symbolic representation of a switching matrix with buffers.

Fig. 11. In a large system it is usually necessary to put each output bus on a separate board. It is highly desirable to have good solid areas of earth on the PCB since this will reduce crosstalk and make the performance more predictable.

Controlling Switches

For an electrically controlled large system it is necessary to consider the control circuits in detail. In particular it may be worthwhile to reduce the number of interconnecting cables by addressing each switch in binary code. By quite simple multiplex techniques a large matrix, say 16 input and 8 output, can be controlled over an 8-way cable. Other considerations are the type of switches that the operator has to use - if momentary contact push switches are used the result must be electronically latched and the whole system suitably interlocked to prevent the selection of more than one source simultaneously. ....and finally

There is no need to be scared of switching systems. If you are new to the art just get a few surplus banks of pushbuttons, wire them up roughly and see how easy it is to get adequate results.

Please send all suggestions, comments, ideas and complaints to:

Jeffrey Borin
50 Bonnersfield Lane,
Harrow, Middx.
HA1 2LE
Tel. 01 863 2880
enclosing a stamped addressed envelope if any reply is required.

A SIMPLE 'SCOPE TRIGGER

by Ian Pawson

This simple and cheap (less than £5) unit, using CMOS ICs provides delay timebase facilities on basic oscilloscopes for viewing tv waveforms. It produces a pulse at the start of a pre-determined line, which, when connected to the next "ext trig" input of a scope, will enable that line to be displayed. Three decade switches (thumbwheel or rotary) are used to select the required line.

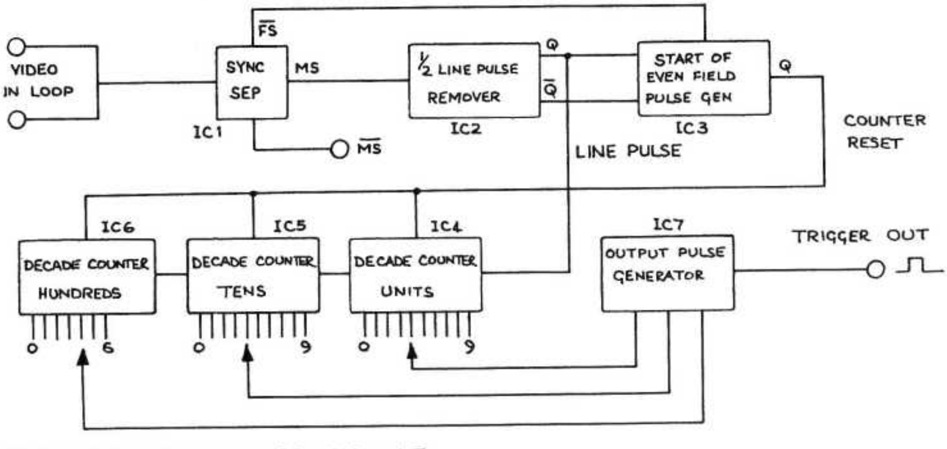
The basic operation is shown in Figure 1, and the circuit diagram in Figure 2. A suitable PCB layout is shown, actual size, in Figure 4 and the components are listed in Figure 5. The method of obtaining the start of even field pulse is shown in Figure 3.

This simple method has one drawback however, and that is line one sync pulse is blanked, resulting in the counter being one line short on the rest of the count. (this could be overcome by using a presetable counter in place of IC 4 and loading it with one after the reset pulse). This means that in order to display the test signal on line 19, the switches must be set to 018. As the counter is triggered at the end of the line pulse, the scope display begins with the back-porch and burst. The output pulse is one line in length and so can be used to "bright up" the trace, if your scope has this facility.

The completed unit consumed 5mA at 9v and is thus easily powered from a PP3 battery, making a small compact portable unit.

ICs 4, 5 & 6 outputs

Q0 - pin 3
Q1 - pin 2
Q3 - pin 4
Q3 - pin 7
Q4 - pin 10
Q5 - pin 1
Q6 - pin 5
Q7 - pin 6
Q8 - pin 9 } not used on IC6
Q9 - pin 11



DECADE SWITCHES SELECT REQUIRED LINE
EITHER ROTARY OR THUMBWHEEL

FIG 1

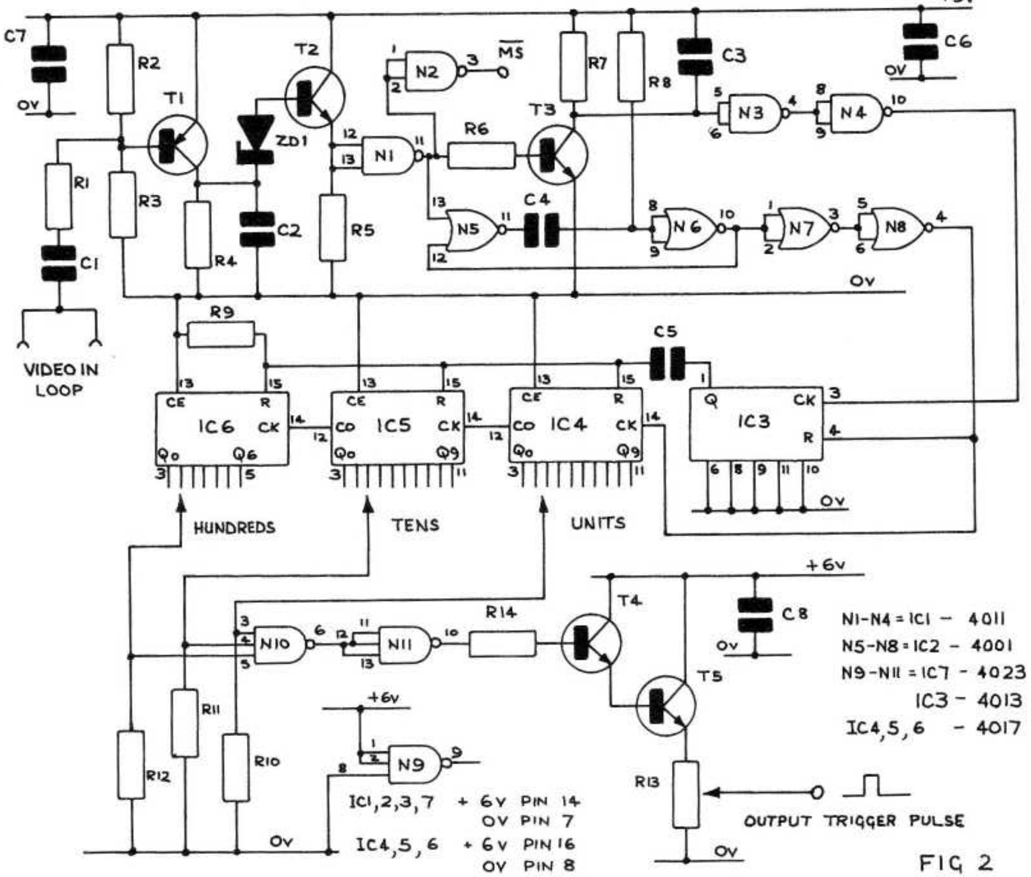

+9v
C7
OV
R2
T1
R1
R3
C1
VIDEO IN
LOOP
T2
ZD1
C2
R4
R5
N1
N2
MS
R6
T3
R7
R8
C3
C6
OV
N3
N4
C4
N5
N6
N7
N8
OV
R9
C5
IC6
IC5
IC4
IC3
CE
R
CK
CO
Q0
Q6
Q9
Q
HUNDREDS
TENS
UNITS
OV
+6v
T4
T5
C8
OV
R14
N10
N11
N9
+6v
R10
R11
R12
R13
OV
OUTPUT TRIGGER PULSE
N1-N4 = IC1 - 4011
N5-N8 = IC2 - 4001
N9-N11 = IC7 - 4023
IC3 - 4013
IC4,5,6 - 4017
IC1,2,3,7 + 6V PIN 14
OV PIN 7
IC4,5,6 + 6V PIN 16
OV PIN 8

FIG 2

COMPONENTS LIST

R1	47
R2	120k
R3	100k
R4	1k
R5	10k
R6	100k
R7	10k
R8	470k
R9	10k
R10	1M
R11	1M
R12	1M
R13	2k2 pot
R14	1k

C1	4.7uF	15v
C2	100pf	
C3	100pf	
C4	220pf	
C5	100pf	
C6	22uF	15v
C7	22uF	15v
C8	10nf	
C9	10nf	
C10	10nf	

T1	BCY70
T2	BC108
T3	BC108
T4	BC108
T5	BC108
D1	BZY88-3V6
IC1	4011
IC2	4001
IC3	4013
IC4	4017
IC5	4017
IC6	4017
IC7	4023

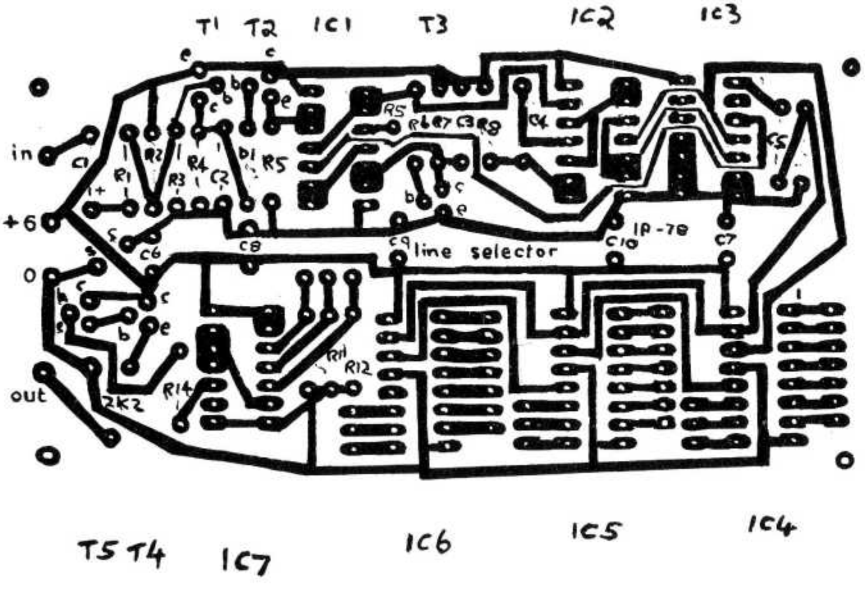
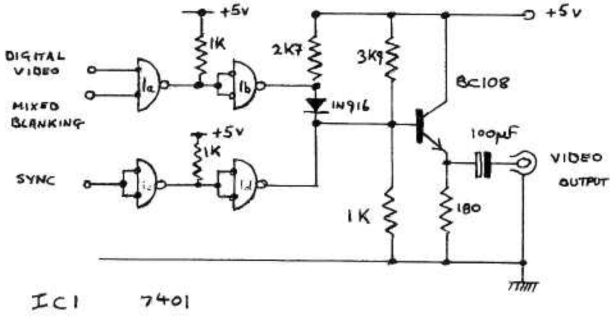


FIGURE 4

A Digital Video & Sync Combiner.

by Keith Wevill



This simple video sync combining circuit is suitable for combining sync pulses from an SPG with "digital video", e.g. T.V. games, VDU, or pattern generator. It can be constructed using a single 7401 or any spare open collector TTL gates, e.g. 7406.

The black level is set by the 3K9 and 1K potential divider on the base of the BC108. When the sync input goes low the base is clamped to 0V taking the output below black level.

A second open collector gate IC1b controls the video, when its output is low the diode is reverse biased and the video output is black level or sync pulse. When IC1b goes high the diode is forward biased and the upper part of the potential divider becomes the 2K7 and 3K9 in parallel, thus increasing the output to white level. The resistor values are chosen to give approximately 1V pk-pk output.

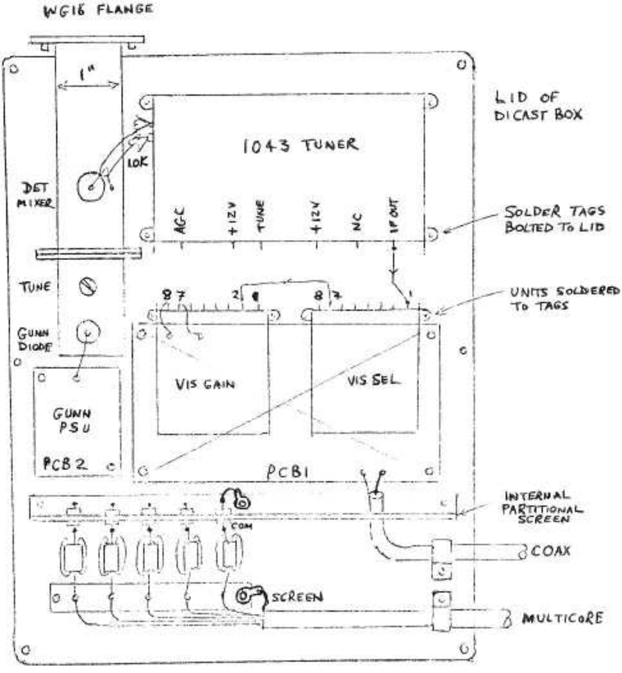
IC1b input is fed from IC1a which combines the video and blanking to produce a logic O when white level is required and a logic 1 when black level or sync is required.

A Remotely Controlled TV Receiver & Transmitter.

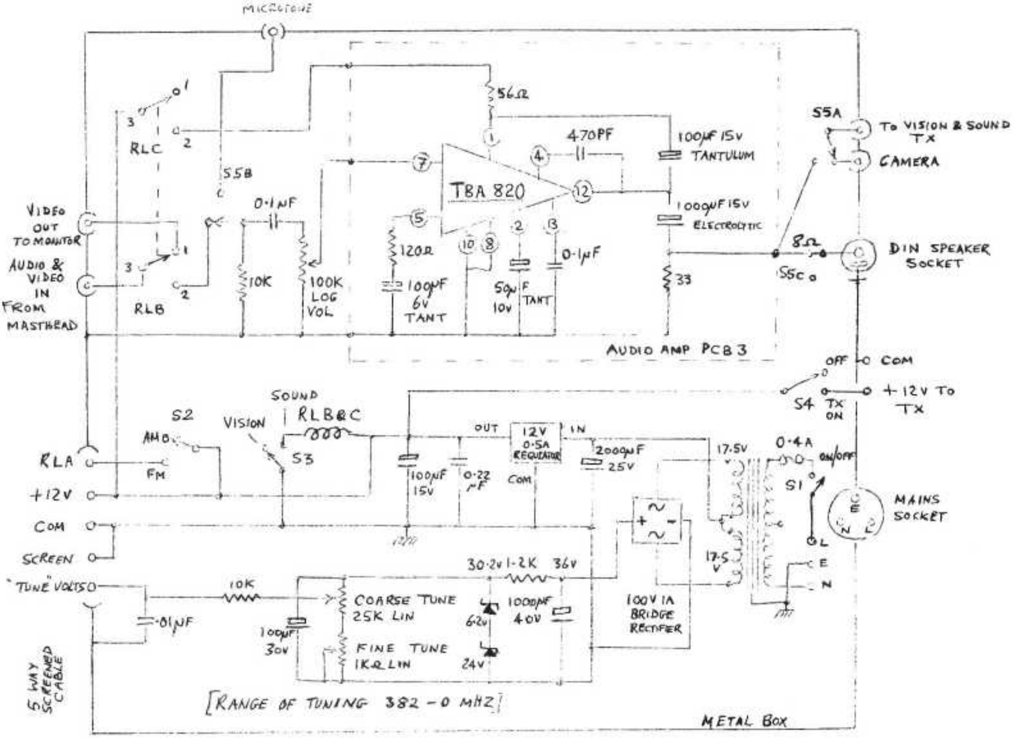
By Peter Johnson

R x tuning range 10.0 GHz to 10.382 GHz or 10.116 - 10.500 GHz depending on pre-set frequency of Gunn diode local oscillator.

This system makes use of Dane Evens Gunn/osc R x assembly published June 1978 Radcoms. The Gunn oscillator is made to cover 9.56 GHz, otherwise the assembly is exactly as in the article for the receiver. This then provides the hardware. The output from the detector mixer is taken directly to a 1043/2 or 3 Mullard TV tuner, which is followed by a vision selectivity modules; this provides our passband which must exclude BBC 405 TV channel 1 on 41.5 MHz and also the 10 m amateur band 28-30 MHz. After this a vision gain module provides either a detected video output or an RF IF output for the FM detector. If FM sound only is required a further stage of IF amplification may be had by adding an identical vision gain module, both being peaked to provide a narrow band IF. The TAA 661 wide band FM limiter decoder integrated circuit may be set up for narrow band by peaking L1 and L2 to the same frequency and



LAYOUT OF UNITS ON LID OF DICAST BOX



REMOTE CONTROL UNIT FOR 3 CM AM/FM TV RECEIVER

G8EIM

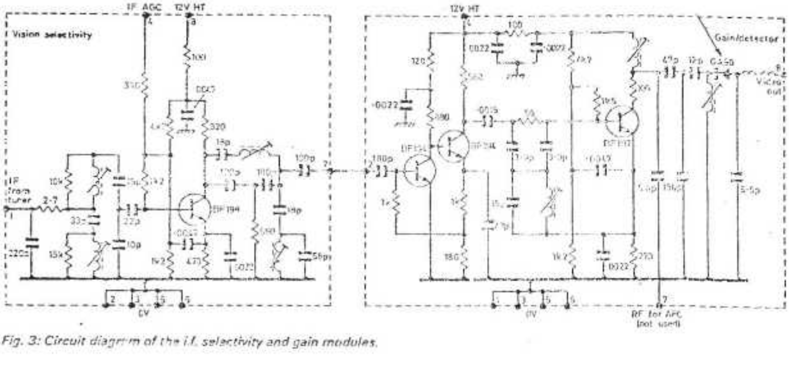
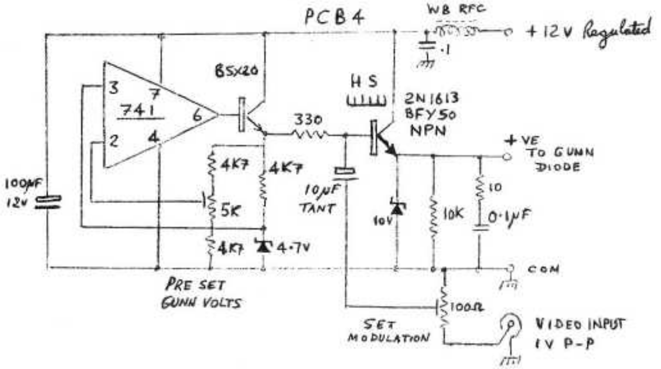
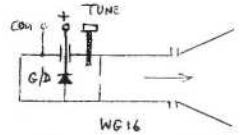


Fig. 3: Circuit diagram of the i.f. selectivity and gain modules.

A SEPARATE TX FOR 3 CM TV FOR MASTHEAD USE G8EIM





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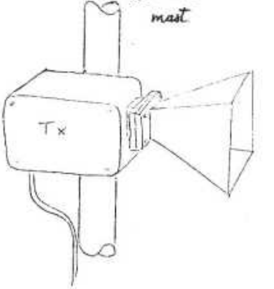
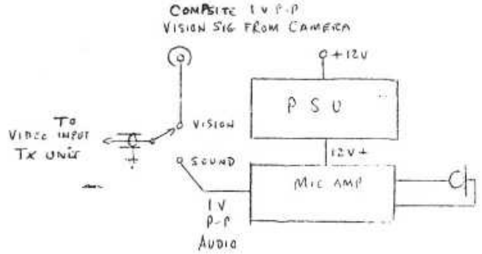




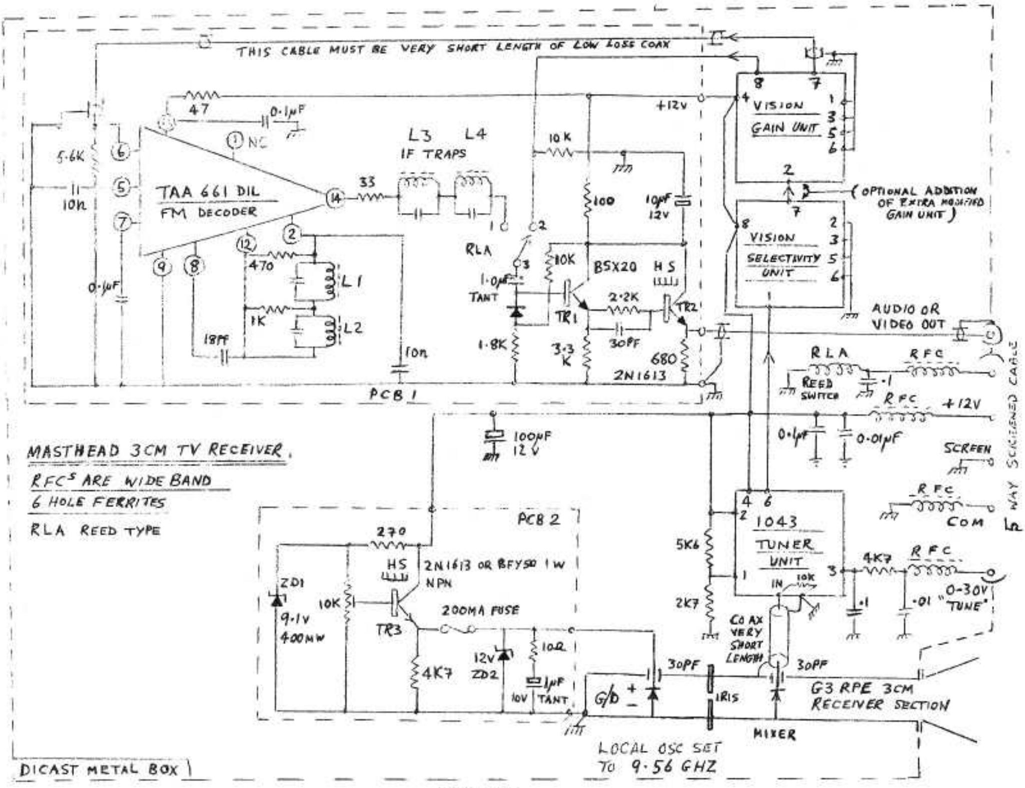
BASIC CONTROL CIRCUIT

removing the 470 ohms and 1K ohms resistors in parallel to the two timed circuits. (Extra gain module also usable for FM TV).

For TV use, the detected output from the vision gain module is positive vision with negative synchronisation (pin 8); this is selected via RLA to the DC restored emitter follower and output stage TR1, TR2. TR2 provides 1V P-P of video into a 75 ohms terminating impedance. TR2 must be fitted with a heat sink to dissipate 1W. The FM detected vision form Pin 14 of TAA 661 contains the video and some IF RF- this must be filtered out with the IF traps L3, L4 these should be able to tune to 36 MHz ± 6 MHz and must be screened. L1 and L2 are tuned hi and low to provide maximum video detected signal. L1, L2, L3 and L4 are identical coils tuned to 36 MHz ± 6 MHz. Winding details are not given as cans and coil-formers vary considerably and is the constructors choice. A double sided PCB is recommended for PCB1, Veroboard is quite suitable for PCB2 3 and 4.

The output vision signal from TR2 must go via a 75 ohms coax to the vision input of the control box. The Relay B and C selects either audio amplifier for sound, or vision monitor for direct viewing. It is normal practice to send AM sound ident on the vision frequency. The power supply provides 0-30 volts for remote tuning of the 1043 tuner and also a regulated 12v at 500 mA. This is also utilised to operate the vision and sound transmitter. The audio amplifier provides the modulator for sound transmissions, the switch S5A and B selecting sound or vision transmissions. All the cables arriving at the masthead receiver must be filtered with wideband RF chokes and decoupled; this is the most troublesome part of the system to debug, as those amateurs who have HF rigs with high power will realise, keeping RF out is hard work.

Note the DC earth is also filtered with a wide band RFC. The only real earth is provided by the coax Braid.



G5EIM

ZD1 9.1V Zener provides the reference voltage to the regulator TR3, a fuse is provided to protect TR3 if the Gunn diode goes short circuit. ZD2 provides spike protection across the Gunn diode, the 10 ohms and 1mf tant provide protection against LF oscillation of the Gunn diode. All components are mounted in a large dicast box. Finally, all joints are weather proofed by application of bath sealer compound.

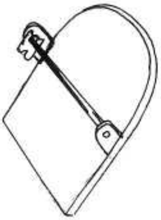
The aerial used is a 25dB Horn made from 22swg copper sheet. This provides enough of a radiation angle to exclude alignment difficulties. (See VHF UHF Handbook for details of Horn). The tuner and IF system may be tested by connecting a UHF antennae to the 1043 and alignment of the selectivity module and gain modules made for Best Received Test Card consistant with maximum definition and gain. The whole system is tested by receiving 3cm TV signals from the transmitter (a separate TX for 3 cm TV). This may be fitted with its own Horn Antenna and mounted on a mast with the receiver when the system is proven to work.

Please note that a stripline or wide band pre-amp could be used between the mixer output and the input to the 1043 tuner. Note that the Plane of Polarization is horizontal i.e. the wave guide is vertical when mounted on a mast.

NOTE Extra Gain Module for use as TV FM RX. The module must be modified, i.e. the det circuit is bypassed so that it may be used as an amplifier at IF frequency. The gain of both modules needs to be controlled by use of the AGC Connection.

Tuners 1043 and Vision Selectivity Modules, Vision Gain Modules - all available from:
Manor Supplies
172 West End Lane
London, NW6.

REFERENCES
VHF UHF Manual Microwaves 8 (D.S. Evans)
RSGB Magazine June 1978 Page 492 (D.S. Evans)



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Reels of Scotch 3m 1" videotape on metal N.A.B. Reels boxed, and only once used - OFFERS
3 reels B.A.S.F. ½" videotape, boxed, little-used OFFERS.
Miscellaneous ½" videotape (Pyrax etc.) approx. 5 reels £5 the lot (this tape is O.K. but not first quality) If interested please ring
Simon Robinson G8T00
Stocksfield, Northumberland 3449.

WANTED

Line output transformer for Pye Monitor Type 7101.
Jim Aldebert
8 Manse Road,
North Mount Vernon,
Glasgow G32 ORA
Tel. 041 778 2978.

FOR SALE

PC Electronics ATV and video gear. If you would like photocopies of their catalogue, please send four 7p stamps and SAE (large) to Andrew Emmerson G8PTH, 4 Mount Pleasant, Blean Common, Canterbury, Kent CT2 9EU. I am NOT an agent for PC Electronics, though if there is sufficient interest I might make arrangements for an established business near here to import them.

FOR SALE

A good home for any IEE, IEEE, IERE, RadComs, Wireless World, SWM, Ham Radio, C Q, 73, QST, C Q - T V, BARTG, AMSAT, Mullard Technical Communications, IBA/BBC Reviews etc. Any journal, books related in any way to Amateur Radio. All donations will, at some future stage, go to form a reference library solely for Radio Amateurs/SWLs. Acknowledgements of contributions will be given.
Steve Budd G8PQU
54 Salvington Hill, Worthing,
Sussex. BN13 3AZ

WANTED

Circuit details of additional wiring (V30) for Pye 2332/C CCU for MkIV industrial camera to utilise internal SPG for additional video sources. Or any other circuits/manuals on said camera.
Norrie Macdonald GM4BVU
3 Townhill Road,
Earnock Estate,
Hamilton, ML3 9UX
Tel. Hamilton 423121.

B.A.T.C. Publications

This is a separate department of the Club. Do not send orders for publications to Club Sales, send orders to B.A.T.C. Publications
64 Showell Lane,
Penn, Wolverhampton,
West Midlands.

Slow Scan Television by B.J. Arnold G3RHI published by B.A.T.C. 2nd. edition 35p +8p p&p
A Guide to Amateur Television published by B.A.T.C. price (post paid) £1.50 to members and £2.00 to non-members. Overseas postage rates on request.

C Q - T V BACK ISSUES. The following issues are at present in stock: Nos. 68, 69, 73, 76, 77, 79, 82, 83, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95 onwards. The stocks of some are very low and will soon run out. They are: Nos. 73, 76, 79, 83 and 86. Back issues cost 50p each for Nos. 93 onwards and 25p prior to 93. Return postage allowance would be appreciated. Any article which has appeared in the journal can be supplied in photo-copy from 5p per sheet. Payment for this service should be in postage stamps. A list of all the main articles which have appeared in C Q - T V giving details of how many sheets are needed to reproduce it is available for 40p (preferably in UK postage stamps) plus a large (9" x 4") s.a.e.

PLEASE NOTE THIS LIST CANCELS ALL OTHERS

B. A. T. C. SALES

CAMERA TUBES	Price	Post & Packing
EEV Leddicon	£82	nil
½" E.M.I. 97777 Ebitron	£28	nil
⅔" E.M.I. 9831 amateur grade vidicon	£11	nil
1" E.M.I. 9677 amateur grade vidicon	£11	nil
1" E.M.I. 9728 amateur grade vidicon	£11	nil
1" English Electric P849 amateur grade vidicon	£12	nil
4½" E.M.I. 9565 Image Orthicon	£10 for two, buyer collects.	

COILS

1" B.A.T.C.	£11.54	54p
1" ex-industrial (limited number only)	£ 6	54p
⅔" E.M.I.	£11.50	54p

ACCESSORIES

Paxolin sockets for 1" or " vidicons	.32	8p
C mount for lens	£ 2.50	10p

STATIONARY

B.A.T.C. headed notepaper and envelopes	£ 1.75	
Lapel badges	40	8p
Adhesive badges (for equipment)	15	8p
Windscreen stickers	6	8p
Reporting charts	12	8p
EEV Camera charts	£ 1.65	30p
B.A.T.C. Test Card	50	10p

PRINTED CIRCUIT BOARDS

C Q - T V SPG printed circuit board ready drilled	£ 3	10p
C Q - T V SPG Genlock Unit printed circuit board ready drilled	£ 3	10p
Project 100 printed circuit boards ready drilled, each	£ 4	10p

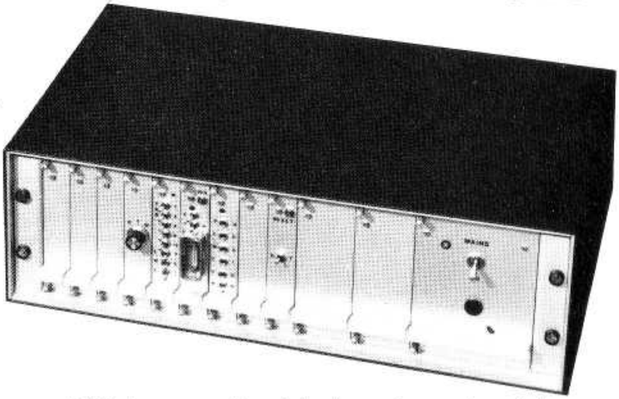
Rapidly increasing postal charges have compelled us to quote the above post and packing charges. Will overseas members please ask for a quotation before sending cash. Obviously, for small items such as badges & stickers etc, one can send several items for the same postal charge - please try and estimate the correct amount. Our thanks go to those members who estimate on the high side and suggest that any balance be put to Club funds.

Please send your order to C. G. Dixon (B.A.T.C. Club Sales)
Kyrles Cross
Peterstow
Ross-on-Wye
Herefordshire.

Project 100 printed boards are available from Tom Mitchell at 30 Old Farm Close, Hounslow, Middlesex, at the prices quoted above. Suitable Xtals are also stocked by him at £2.60 each. (4fsc and 5 MHz)

PLEASE NOTE THIS LIST CANCELS ALL PREVIOUS ONES.

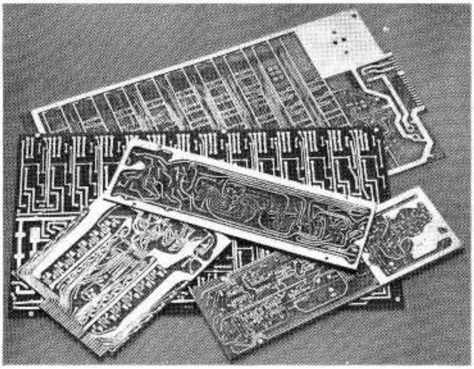
T.V. CHARACTER GENERATOR



The Crofton character generator has been designed to produce upper case alpha, numerics and sundry symbols. The standard keyboard having 60 keys. The equipment will lock to a standard mixed sync source and provide a composite output of 1.4v p-p into 75 ohms.

The standard format provides 3 pages of 16 characters by eight lines. Page select is by simple rotary switch.

This inexpensive instrument will find many applications within the video field for both the professional and semi professional user. Price on application.



The Crofton PCB Service

The Crofton P.C.B. service has been set up to offer a service to both the small and medium sized electronics company.

Being fully aware of the pressures on most engineers today, we have set up a specialist operation capable of producing P.C.B. designs and boards from the most scanty information.

You give us the circuit and we will do the rest. Whether you want high quality or low price commercial boards we can offer you a competitive service. Prototypes can normally be provided within 2—3 days from receipt of artwork.

So next time you're in the market for this type of service just give us a ring.

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